Rapid Deployment Flood Control System

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July 3, 2004

Current U.S. Class:	**205/114**; 220/1.6; 220/495.06; 220/646; 450/20; 405/111
Intern'l Class:	**E02B 003/12**
Field Of Search:	405/20, 70, 71,121, 108-111, 114-115, 110, 16, 17 107, 220/1.6, 495.05, 495.06, 62.11, 608, 623, 669-673, 62.18, 645, 646

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BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates broadly to methods for preventing or inhibiting the flow of water or other fluids, including oily water or toxic chemicals. In a preferred aspect, the invention relates to flood control systems, and more preferably to mobile flood control systems.

2. Description of the Related Art

Flood control systems may be classified as either stationary or mobile. One common type of stationary flood control system is affixed, concrete dam. An early effort at improving stationary dams is disclosed in U.S. Pat. No. 1,077,791, disclosing a concrete dam structure having a "honeycomb" construction, with individual cells that may be either empty or filled with water. Another common and relatively inexpensive stationary flood control system is an earthen levee.

Some of the disadvantages with stationary flood control systems are the amount of time needed and the high cost to engineer and build them. Other disadvantages are that these systems consume a tremendous amount of land and result in the destruction in valuable historic and ecologic treasures. Other disadvantages are that the dam is fixed in a permanent location and the designed capacity that may be inadequate because the amount of rain can vary greatly. Also the adverse impact upon the environment that these systems produce is

now widely recognized. In some areas dams are being destroyed. Yet this does not negate the fact that a viable means for flood control is needed in place of these systems hence this device will meet this need.

For mobile flood control, sandbags have been and still meet the most well-known and widely used technique. During flooding, sandbags are typically placed by human hands at locations that are still above the rising water level, to collectively create a wall, dam, or barrier against the floodwaters. Sandbags, however, have a number of logistical problems and disadvantages.

One of the problems with sandbags lies in the amount of human labor required for their installation. Each bag must be filled, usually by hand, and then placed at the location where the barrier is being constructed. Another problem is obtaining and transporting sufficient quantities of sand for filling purposes, which is often very expensive and time-consuming. Another problem is the logistics of coordinating the human effect of filling the bags and placing them at the right location within the appropriate time frame.

Another problem that can make the use of sandbags very difficult is the fact that sandbags must often be placed in pouring rain creating safety hazards. Still another problem is that the placement of the bags must be done in a precise manner otherwise instability will be created. Another problem is that plastic sheeting or netting is often needed to prevent seepage and weakening of the dam. Another problem is that the sandbag dam requires constant monitoring and maintenance to prevent a breakthrough resulting in failure.

Still another problem is that after flooding, once the waters have subsided, the sandbags must be removed, either in a filled condition, or else emptied of their contents at the location.

As a result, other approaches have been suggested and tried as a substitute for sandbags. Many of these other approaches rely on water or fluid (instead of sand) placed inside tubes or other structures to provide the weight needed to resist the hydrostatic forces of rising water. Such systems are exemplified in the "Water-Bag Dam or Dike and Method," disclosed in

Jackson III, U.S. Pat. No. 4,692,060; in the "Portable Highway Barrier," disclosed in Chiodo, U.S. Pat. No. 4,869,617; in the "Barrier for Containing Floods," disclosed in Coffey, U.S. Pat. No. 4,921,373; in the "Device for Controlling Flood Waters and/or Hazardous Liquid Spills," disclosed in Hendrix, U.S. Pat. No. 5,040,919; in the "Apparatus and a Method for Joining Water Structure Sections or the Like," disclosed in Doolaege, U.S. Pat. No. 5,059,065; in the "Wall-Like Retainer Segments for Retaining Fluids," disclosed in Baker, U.S. Pat. No. 5,632,5723; and in the "Flood Control System" disclosed in Perry, et. al, U.S. Patent 6,012,872; and in the "Flood Control Barrier," disclosed in Dery, U.S. Patent 6,551,025; and in the Water Filled Membrane Dike," disclosed in Clement, U. S. Patent 6,641,329.

These systems can be rather complex to use. For example in Clements, U.S. Pat. No. 6,641,329, the "Water Filled Membrane Dike" involves a complicated system of elongated, inflatable round bladders that can roll when filled. At least one of the shortcomings of the above systems is that they are difficult to install quickly. Further, some are incapable of providing resistance to flood waters unless they are filled with water. They lack the structural strength of rigid structures or containers.

Some systems rely on the use of individual "water bags" or other plastic, flexible water-filled articles of various sizes. These water bags serve essentially as replacements for sandbags. These are exemplified by the "Flood Disaster Control Bag," in Wagner et al., U.S. Pat. No. 4,362,433; the "Water Filled Plastic Dam Structure," in Serota, U.S. Pat. No. 3,213,628; the "Hovering Bag Breakwater," in Weigel et al., U.S. Pat. No. 3,191,386; and the "Method and Apparatus for Constructing Hydraulic Dams and the Like," in U.S. Pat. No. 5,125,767. Among the many shortcomings of these "water bag" approaches is that many of them simply do not adequately overcome the time and labor problems presented by sandbags. For example, the water bags or containers in Wagner '433 and Serota '628 must be filled with water before they can provide an effective barrier to flood waters. The plastic container in Serota '628 must be filled with water even before it is positioned, since without water, in its collapsed state, it is essentially formless. Unless these containers are filled with water, they cannot be stacked nor can they even form an effective barrier.

Other systems rely on the use of a plurality of water-filled rigid containers of various shapes and sizes. The structure and materials of composition of these containers enable them to set up easier than the flexible water bag, and membrane tubular shape systems. These features also enable them to provide greater resistance to the hydrostatic forces of rising water. These are exemplified by the "Portable Highway Barrier" disclosed by Chiodo, in U.S. Patent 4,869,617 and in the "Flood Control System," disclosed in Perry, et al, U.S. Patent 6,012,872.

Among the many shortcomings of these "water-filled containers" approaches in the time needed to fill them. Another shortcoming of these and other water filled systems is the need for a pump or other means to fill the containers from the top must be supplied by the user. Another shortcoming is the need for fuel or power to operate the pump.

Another shortcoming is the weight of the empty containers in some systems requires power-operated equipment to transport and position. In U.S. Patent 6,012,872 Perry et al suggested using large shipping containers e.g. corrugated metal containers that are about 20 feet long, 8.5 feet high and 8 feet wide available from TransAmerica, Inc. and Sea Container, Inc. The weight of the containers requires heavy lifting equipment with skilled operators to deposit them at the desired location. The weight of the containers and the use of the lifting equipment increase the risk of injury and death for those who assist with the deposition of the containers. These factors increase the logistics and cost of using these systems.

Another shortcoming is the complexity of providing an adequate means of stability against tipping over in some of these systems. For example in U.S. Patent 6,012,872 Perry, et al suggested using the anchoring members of concrete structures embedded in the surface. The use of this anchoring means limits the locations where the systems can be placed.

Due to changes in land development and rain patterns the flooding patterns will and do change requiring the flood control system being utilized to be more adaptable and flexible than the present stationary and mobile flood control systems being used. The need for an

improved mobile flood control system that provides a means of utilizing containers that can be transported quickly and easily. The need for an improved mobile flood control system that provides a means of utilizing containers that can quickly and easily deposited onto the surface adjacent to the flood area. Also the flood control system will have a means of having containers deposited in an empty state and be self filled by the rising food water. According, as discussed in greater detail below, the present invention provides a much-improved approach o flood control, overcoming one or more of the above shortcomings of earlier systems.

SUMMARY OF INVENTION

In a broad aspect, the invention is directed to a flood control method and apparatus. In a specific aspect, the method involves: (a) providing a plurality of containers, at least one of the containers having a bottom portion a pair of end panels and a pair of substantially rigid sidewalls operably connecting the bottom portion and pair of end panels; (b) attaching a plurality of containers the containers being attached in an abutting relationship and (c) positioning the plurality of substantially rigid containers at a selected location proximate a body of water, at least some of the substantially rigid containers being positioned at the selected location in a substantially abutting relationship, to form a barrier. Preferably, as discussed in greater detail below, the containers are constructed of a bottom panel and the bottom panel is constructed of sections of pipe, a pair of end panels and the end panels are constructed of sections of pipe, and a pair of sidewalls and the sidewalls are constructed of sections of pipe with a pair of metal frames operably connecting the bottom panel and pair of end panels.

In a more specific aspect, the flood control method includes the steps of: (a) identifying a flood zone area prior to flooding, the flood zone area being proximate a body of water having a top surface, the body of water being susceptible to flooding whereby the top surface of the body of water rises and the water flows into, and onto, the flood zone area; (b) identifying a flood protection barrier area proximate the flood zone area; (c) providing a substantially level support surface within the flood protection barrier area; (d) providing

a plurality of containers, the containers having a bottom panel, a pair of end panels, and a pair of sidewalls operably connecting the bottom panel and pair of end panels; (e) positioning at least some of the substantially rigid containers in a substantially empty state adjacent to one another in a substantially abutting relationship on the substantially level support surface within the barrier zone to form a barrier to flooding; (f) attaching at least one of the substantially rigid containers to an adjacent substantially rigid container; and (g) forming a seal between adjacent substantially rigid containers to prevent the flow of water between the adjacent substantially rigid containers.

Another aspect of the invention relates to a flood control apparatus, which preferably includes: (a) at least two adjacent, substantially rigid containers in a substantially abutting relationship, each of the at least two containers having a bottom panel, a pair of end panels, and a pair of sidewalls operably connecting the bottom panel and pair of end panels, defining a receptacle for receiving variable amounts of water; and (b) some form of sealing means for preventing floodwater from passing between the containers.

In still another specific embodiment, the flood control apparatus includes a plurality of rigid containers, each of the containers including at least an outer housing which is constructed of plastic pipe and a pair of metal frames which is capable of being moved from location to location, of being attached to a second, adjacent movable housing by two or more fasteners, the first housing having a bottom panel, a pair of end panels, and a pair of sidewalls operably connecting the bottom panel and pair of end panels a top portion and a bottom portion, wherein the plurality of containers are positioned in a selected location on a substantially horizontal surface in or proximate a flood zone, the containers being placed end-to-end to form a barrier, the plurality of containers being positioned above the water level of the body of water.

In yet another specific embodiment, a flood control apparatus of this invention includes (a) an outer container having a bottom panel, a pair of end panels, and a pair of sidewalls operably connecting the bottom panel and pair of end panels; and (b) an inner flexible container wherein the flexible container is a bladder constructed of plastic membrane

which is disposed inside the outer container, the bladder having an opening for introducing water into the bladder: (c) a pipe inserted through one of the bottom corners of the front sidewall of the outer housing; (d) the pipe being sealed between the pipe and the juncture with the with the front sidewall; (e) the opening of the flexible container being attached to the end of the pipe inside the outer container; (f) a detachable one way flow valve being connected to the other end of the pipe outside the outer container; (g) the one way flow valve allows water to flow into the flexible container.

Another specific embodiment of the apparatus, which is preferred, particularly where the contours of the flooding zone are uneven, or where there are natural obstacles proximate the body of water such as trees and the like, is a flood control apparatus that includes: (a) a plurality of containers, at least one of the containers having a bottom portion a pair of end panels and a pair of substantially rigid sidewalls operably connecting the bottom portion and pair of end panels; (b) positioning at least two of outer containers at right angle to one another in an abutting relationship along their edges; (c) a right angle metal bracket covered by a layer of rubber operably connecting at least two of outer containers positioned at right angle to one another in an abutting relationship along their edges.

A specific embodiment of this invention, which is preferred, is to provide a container that is transportable and includes a housing constructed of pipe with a steel frame capable of being moved from location to location, and of being attached to a second, adjacent housing by one or more fasteners. The housing having a bottom panel, a pair of end panels, and a pair of sidewalls operably connecting the bottom panel and pair of end panels.

The flood control method can also include the step of the containers being self filled with water as the level the flood water rises to provide sufficient weight to the containers to resist the hydrostatic forces of the rising flood water.

Further, the flood control method should include the step of attaching a flexible container into the rigid containers, then allowing the flood water to fill the inside of the flexible

container as the flood water rises outside the rigid container. The flexible containers should be expandable bladders made of a material such as plastic, with an opening to receive water. In using the flexible container with the flood control method, the water can be removed by detaching the one way flow valve from the water inlet pipe and allowing the water to drain out similar to deflating a swimming pool.

The flood control method also includes the step of connecting one or more of the plurality of substantially rigid containers to another container. Further, where at least two of the substantially rigid containers are adjacent to one another, a rubber gasket is sealed to the outer edges of the metal frames of the sidewalls and bases. The sidewalls and bases are tightened together by fasteners to form a liquid tight seal. The use of foam and plastic sheeting as suggested by Perry, et al produces a less durable seal and can be damaged or deformed preventing the seal from occurring. The damage foam seal and plastic sheeting become a waste that must be disposed of and replaced increasing the cost of use of the flood control system. If the foam or plastic sheeting supplies run out the integrity of the system is compromised.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a side view of a flood control system positioned on a surface for flood control.

FIG. 2 is a front view of a flood control system positioned on a surface for flood control.

FIG. 3 is a three dimensional view of a single container positioned on a surface.

FIG. 4 is an outer view of front sidewall with water inlet pipe.

FIG. 5 is an inner view of front sidewall with water inlet pipe.

FIG. 6 is an outer view of rear sidewall.

FIG. 7 is an inner view of rear sidewall.

FIG. 8 is an outer view of side panel.

FIG. 9 is an overhead view of front bottom panel

FIG. 10 is a side view of components.

FIG. 11 is an overhead view of components.

FIG. 12 is a flood control system with unfilled bladders positioned on a surface for flood control.

FIG. 13 is a flood control system with filled bladders positioned on a surface for flood control.

FIG. 14 is an overhead view of a flood control system with unfilled bladders positioned on a surface for flood control.

FIG. 15 is an overhead view of a flood control system with filled bladders positioned on a surface for flood control.

DETAILED DESCRIPTION AND SPECIFIC EMBODIMENTS

As mentioned above, the invention is preferably directed to flood control systems. Both methods and apparatus for flood control are within the scope of the invention. We will now describe specific embodiments, examples and versions of the invention, for the purpose of enabling others skilled in the art to make and use our invention. It is understood, however, that the invention is not limited to these specific embodiments, examples and versions. Nor is the invention restricted to flood control as such, but may be used in other applications involving the forming of a barrier to prevent or restrict the flow of any liquid.

A person skilled in the art that has read this patent or seen the invention being used, described, or implemented will recognize many variations of the invention that might not be expressed here. Thus, it is the claims below that should be referred to for purposes of determining the scope of the invention, not only the literal elements therein, but also their substantial equivalents, including elements known to be interchangeable.

FIG. 1 is a side view of a flood control system. FIG. 2 is a front view of the same flood control system, as viewed from the body of water that is susceptible to flooding, e.g., a river or lake. In the particular embodiment shown in FIGS. 1 and 2, the barrier 22 is composed of individual rigid containers 22a, 22b, 22c, and 22d. (These will be referred to collectively as "containers," using the single reference number 22.) As shown in FIG. 1,

the first column of containers 22a and 22b are stacked on top of one another. The second column of containers 22c and 22d are stacked behind the first column of containers, on the other side, and cannot be seen in FIG. 1, but can be seen in FIG. 2. Naturally, the barrier of the invention may include any combination or configuration of containers. As will be discussed below, the design, materials of composition and construction of the containers 22 provide for the ability to stack the containers as shown in FIGS. 1 and 2 as well as facilitate easy transportation, installation and easy of use.

FIG. # 3 is a three dimensional view of the container 22 deposited on the surface.

FIG. # 4 is an outer view of the front sidewall panel 24 showing the metal frame constructed of two pairs of parallel right angle sections 36 and 42 of metal joined at right angles at the ends. The frame is attached to the pipe sections 38 which are sealed to together by a watertight sealant. A water inlet pipe 40 is inserted into the lower left corner of the sidewall and sealed to the sidewall by a watertight sealant. A rubber gasket 34 is sealed along the edge of the metal frame. Also shown are holes 46 for inserting threaded rods that used to tighten along with the washers and nuts to operably connect the bottom panel 30, end panels 28 and sidewalls together.

FIG. # 5 is an inner view of the front sidewall panel 24 showing the rubber gasket 50 sealed to the pipe sections 38, which are sealed to together by a watertight sealant. A water inlet pipe 40 is inserted into the lower left corner of the sidewall and sealed to the sidewall by a watertight sealant. Also shown are holes 46 for inserting threaded rods that used to tighten along with the washers and nuts to operably connect the bottom panel 30, end panels 28 and sidewalls together.

FIG. # 6 is outer view of the rear sidewall panel 26 showing the metal frame constructed of two pairs of parallel right angle sections 36 and 42 of metal joined at right angles at the ends. The frame is attached to the pipe sections 38 which are sealed to together by a watertight sealant. A rubber gasket 34 is sealed along the edge of the metal frame. Also

shown are holes 46 for inserting threaded rods that used to tighten along with the washers and nuts to operably connect the bottom panel 30, end panels 28 and sidewalls together.

FIG. # 7 is an inner view of the rear sidewall panel 26 showing the rubber gasket 50 sealed to the pipe sections 38, which are sealed to together by a watertight sealant. Also shown are holes 46 for inserting threaded rods that used to tighten along with the washers and nuts to operably connect the bottom panel 30, end panels 28 and sidewalls together.

FIG. # 8 is an outer view of an end panel 28, which is constructed of sections of pipe.

FIG. # 9 is an overhead view of the bottom panel 30, which is constructed of sections of pipe.

FIG. # 10 is a side view of the components required to construct a container 22 consisting mainly of a bottom panel 30, two end panels 28, a front sidewall panel 24 and rear sidewall panel 26, water inlet pipe 40, threaded plug 54, threaded rods 56, washers 58, and nuts 60.

FIG. # 11 is an overhead view of the components required to construct a container 22 consisting mainly of a bottom panel 30, two end panels 28, a front sidewall panel 24 and rear sidewall panel 26, water inlet pipe 40, threaded plug 54, threaded rods 56, washers 58, and nuts 60.

FIG. 12 is a side view of the flood control system containing the attached unfilled bladders 64. FIG. 13 is a side view of the same flood control system, after the body of water has caused flooding and the bladders 64 have been filled by the rising floodwater 0.

FIG. # 14 is an overhead view of the flood control system 22 showing empty three units 22a, 22b, and 22c joined together forming a flood barrier 22.

FIG. # 15 is an overhead view of the flood control system 22 showing three units 22a, 22b, and 22c water filled bladders 64a, 64b, and 64c joined together forming a flood barrier 22 against rising floodwater 70.